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Infrared Properties of Cataclysmic Variables from 2MASS: Results from the 2nd Incremental Data Release

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Abstract. Because accretion-generated luminosity dominates the radiated energy of most cataclysmic variables (CVs), they have been "traditionally" observed primarily at short wavelengths. Infrared (IR) observations of CVs contribute to the understanding of key system components that are expected to radiate at these wavelengths, such as the cool outer disk, accretion stream, and secondary star. We have compiled the J, H, and $K_{\rm s}$ photometry of all CVs located in the sky coverage of the 2 Micron All Sky Survey (2MASS) 2nd Incremental Data Release. This data comprises 251 CVs with reliably identified near-IR counterparts and S/N>10 photometry in one or more of the three near-IR bands.

1. Orbital Period-Color Diagram

One of the hoped for goals of observing CVs in the IR is to isolate the luminosity contribution of the secondary stars, and learn more about the mass donors in these systems. Figure 1 shows the $(J-K{\rm s})$ colors of the CVs in the 2MASS 2nd Incremental Data Release Point Source Catalog for systems with known orbital period (as compiled in Downes et al. 2001). The thick curve shows the color of the expected CV secondary star as a function of orbital period (Smith & Dhillon 1998). The horizontal bars show the range of orbital period over which each secondary star spectral type is found. If the near-IR data truly isolated the secondary star luminosity, then all of the points would lie along the curve inside the range delimited by the bars. For the (admittedly few) long period systems ($P_{\rm orb} > 7.5$ hr), this expectation is met fairly well. However, the majority of short orbital period CVs are offset blueward of the $(J-K_{\rm s})$ color of their expected secondary stars. This blue contamination of their near-IR luminosities is almost certainly related to the accretion process.

Four CVs are labeled in the figure; these are U Gem, SS Cyg, RW Tri, and TV Col. These systems have the best known distances of all CVs, determined from trigonometric parallaxes measured with the *HST* Fine Guidance Sensors

(Harrison et al. 1999; McArthur et al. 1999, 2001). All four of these CVs fall remarkably close to the main sequence when their distances are used to place them in an M_K vs. $(J-K)$ color-magnitude diagram. However, Figure 1 clearly shows that only U Gem has a near-IR color consistent with that of the secondary star expected at its orbital period. The other three CVs are substantially contaminated by blue light from the accretion process.

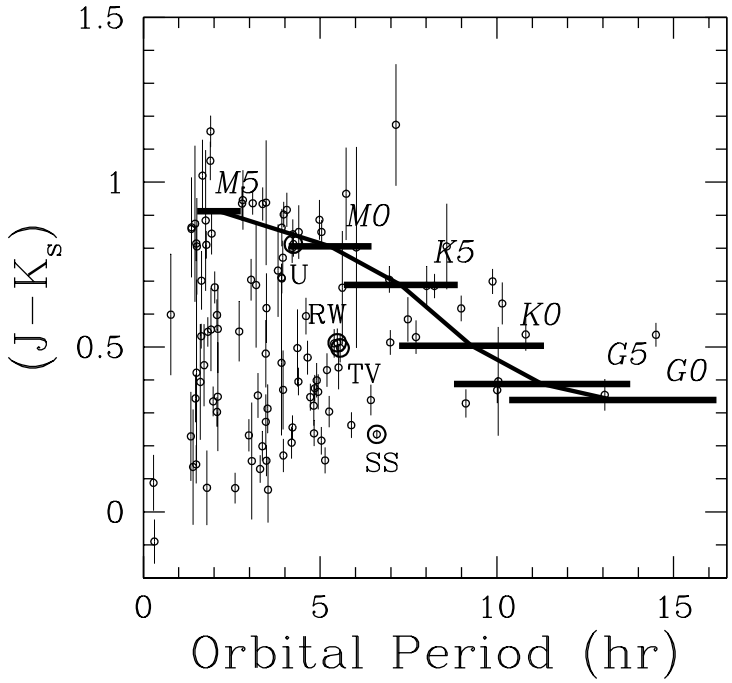

Figure 1. IR color of CVs as a function of orbital period.

For more information about the IR properties of CVs from 2MASS, see `http://www.ctio.noao.edu/~hoard/research/2mass/` and Hoard et al. (2001).

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